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The study of default mode transcendence in schizophrenic patients with negative and positive symptoms by Bender-Gestalt and Wisconsin Card Sorting Tests

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Abstract

The goal of this study was to investigate the transcendence of default mode, as an index of prefrontal function, in schizophrenic patients with negative and positive symptoms by Bender-Gestalt and Wisconsin Card Sorting Test (WCST). For this purpose, 40 schizophrenic patients, that 17 of them had negative and 23 patients had positive symptoms, were selected. Bender and WCST were implemented on the samples. T-test results indicated that on Bender between the two groups, the criteria of rotation ($p<0.005$) and shorting ($p<0.05$) had a significant difference. On WCST, patients with negative and positive symptoms had a significant difference in numbers of categories ($P<0.005$) and attention shift ($P<0.01$). Also, results of correlation analysis indicated that there were significant correlations between the perseveration in Bender and perseveration in WCST and between concretization in Bender and the necessary time for success on the first category in WCST.

Keywords: schizophrenia, Bender-Gestalt Test, Wisconsin Card Sorting Test (WCST), frontal lobe, default mode

1. Introduction

Schizophrenia and other serious mental illnesses are increasingly being recognized as neurocognitive disorders (Rempfer et al., 2006). Deficits in neurocognitive functions are the core features of schizophrenia (Keefe et al., 2006). There is increasing evidence of structural and functional brain impairments in schizophrenia (Andreasen et al., 1990). Although these impairments are controversial, several neurological structures are at the heart of a certain consensus (Heinrichs et al., 1993). One popular hypothesis postulates a dysfunction of the dorsolateral prefrontal cortex. Structural and functional neuroimaging studies have implicated the prefrontal cortex (PFC) as a site of functional and structural alterations in schizophrenia (Vostrikov et al., 2007). The prefrontal cortex plays an important role in the processing and integration of internal and external information, in abstraction and problem solving and in the planning, execution and evaluation of behaviour (Ewerett et al., 2001).

Stuss and Knight (2002) and Mesulam (2000) believes that prefrontal cortex functions can be conceptualized as an attempt to constrain or transcend the influence of default mode of frontal cortex and its stimulus bound style of responding to the environment. As an example of these functions we could mention the arbitrary changes in thinking, the suppression of perseveration, the arbitrary and revisable linkage of emotional valence to secondary reinforces, the ability to inhibit proponent tendencies and the parallel processing of multiple variables.

Many studies show that patients with schizophrenia perform poorly in the WCST categories and commit more errors on the Bender-Gestalt test than normal subjects (Ewerett et al., 2001, and Marli, 1982). Thus these tests are

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sensitive to prefrontal functions (lezak, 2004). WCST and Bender-Gestalt tests are sensitive to frontal lobes and specially to prefrontal functions and Some of these functions are served as transcendence of default mode.

This research was carried out with the aims of assessing schizophrenic patient groups with negative and positive symptoms on the Bender-Gestalt and Wisconsin card sorting Test (WCST) and finding the correlation of scores of these two tests.

2. Research Methodology

This research was conducted with the aims of assessing a schizophrenic patient group with negative and positive symptoms on the Bender-Gestalt and Wisconsin Card Sorting Test (WCST) as indexes of prefrontal functions and finding the correlations between the scores of these two tests. For this purpose, 40 schizophrenic patients, who had been hospitalized in Razi Hospital and who based on DSM-VI-TR criteria had been diagnosed as schizophrenic by hospital psychiatrists and psychologists, were selected. The Scale for Assessment of Negative Symptoms (SANS) and the Scale for Assessment of Positive Symptoms (SAPS) were implemented. Seventeen patients had negative and 23 patients had positive symptoms. Bender and WCST were administrated to the samples. Bender was scored based on Hain's 15 criteria and WCST was scored based on five scales. Hain's quantitative scoring method is used to diagnose brain damages in adults. According to this method there are fifteen error indicators: perseveration, rotation, distortion, splitting, overlapping, lines splitting, decoration, mild rotation, contact point in A design, concretization, additional angular, omission, lack of erasing, lack of besieged, shorting.

Also five criteria were scored in WCST. These criteria were: number of categories, number of trials for success on the first category, the necessary time for success on the first category, total trials related to attention shift and number of perseveration errors. The necessary time for success on the first category was considered for the first time in this research as a WCST criteria.

3. Results

Means and standard deviations for Hian's fifteen errors indicators for all schizophrenic patients are presented in Table 1.

Table 1: Means and standard deviations for schizophrenic patients (n=40) on Bender based on Hian's fifteen errors indicators

SCALES	PERSEE.	ROTATION	CONCRA.	AD. ANG.	LINE SPI.	OVER.	DISTO.	DECOR.	MILD ROTA.	OMIT.	SHOR.	SPILI.	LA. OF EAR.	LA. OF	CON. PO. A
MEANS	1.78	1.21	0.15	0.21	0.31	1.12	1.4	0.28	1.15	0.53	0.43	1.03	0.81	0.40	0.28
STA. DEVATION	1.28	0.90	0.11	0.17	0.27	1.10	1.21	0.25	0.57	0.43	0.34	0.93	0.73	0.36	0.22

For comparisons between patients with negative and positive symptoms, means, standard deviations and significant levels were calculated for the two groups and t-test was used (Table 2).

Table 2: t-test results for two groups (Sc. With Negative Sym. N=17, Sc. With Positive Sym. N=23)

Hain's criteria in Bender	Means	Sta. Deviation	T	Sig. level

Perseveration	Sch. With Negative Sym.	1.92	0.615	0.564	0.577
	Sch. With Positive Sym	1.66	1.644		
Rotation	Sch. With Negative Sym.	1.71	0.825	3.078*	0.004
	Sch. With Positive Sym.	0.83	0.785		
Concretization	Sch. With Negative Sym.	0.07	0.267	0.943	0.353
	Sch. With Positive Sym.	0.22	0.548		
Addi. Angular	Sch. With Negative Sym.	0.21	0.425	0.052	0.959
	Sch. With Positive Sym.	0.22	0.427		
Lines Splitting	Sch. With Negative Sym.	0.07	0.267	0.139	0.264
	Sch. With Positive Sym.	0.00	0.000		
Overlapping	Sch. With Negative Sym.	1.42	2.563	0.869	0.392
	Sch. With Positive Sym.	0.88	0.582		
Distortion	Sch. With Negative Sym.	1.64	1.215	0.971	0.339
	Sch. With Positive Sym.	1.22	1.215		
Decoration	Sch. With Negative Sym.	0.14	0.363	0.092	0.284
	Sch. With Positive Sym.	0.38	0.777		
Mild Rotation	Sch. With Negative Sym.	1.14	0.662	0.115	0.910
	Sch. With Positive Sym.	1.16	0.514		
Omission	Sch. With Negative Sym	0.71	0.825	1.143	0.262
	Sch. With Positive Sym.	0.38	0.777		
Shorting	Sch. With Negative Sym.	0.78	1.050	2.191**	0.036
	Sch. With Positive Sym.	0.16	0.514		
Splitting	Sch. With Negative Sym.	1.35	1.806	1.806	0.081
	Sch. With Positive Sym.	0.77	0.732		
Lack of Erasing	Sch. With Negative Sym	1.00	0.877	1.005	0.323
	Sch. With Positive Sym.	0.66	0.970		
Lack of Besieged	Sch. with Negative Sym.	0.57	0.755	1.250	0.221
	Sch. With Positive Sym.	0.27	0.574		
Contact Po. In A Design	Sch. With Negative Sym.	0.14	0.363	1.338	0.191
	Sch. With Positive Sym.	0.38	0.607		

*P<0.005 **P<0.05

Table 2 indicates that there are significant differences between two groups' means in shorting (0.005) and rotation (0.05). In other words, considering means, patients with negative symptoms had more errors in these two scales than patients with positive symptoms.

Means and standard deviations for five scales of WCST were calculated that are represented in Table 3.

Table 3: Means and standard deviations for schizophrenic patients (n=40) on five criteria of WCST

ERRORS	No. of categ.	No. of trail for first categ.	Sum of persev.	Time for first categ.	Attention shift
MEANS	2.31	34.00	20.75	7.87	70.53
St. D.	1.25	28.37	11.75	3.28	32.56

Also, to compare the patients with negative and positive symptoms, means, standard deviations and significant levels were calculated for the two groups and t-test was used (table 4).

Table 4: t-test results for two groups (Sch. With Negative Sym. N=17, Sch. With Positive Sym. N=23)

five criteria of WCST		Mean	Standard D.	T	Sig. level
Number of categories					
	Sch. with Negative Sym.	2.14	0.95	0.67*	0.004
	Sch. With Positive Sym	2.44	1.46		
Number of trials.					
	Sch. with Negative Sym.	32.78	26.49	0.17	0.214
	Sch. With Positive Sym	34.94	41.74		
Sum of perseveration					
	Sch. with Negative Sym.	22.50	14.66	0.74	0.639
	Sch. With Positive Sym	19.39	9.13		
Necessary time.					
	Sch. with Negative Sym.	8.00	2.66	0.19	0.089
	Sch. With Positive Sym	7.78	3.78		
Attention shift					
	Sch. with Negative Sym.	83.07	18.49	2.01**	0.007
	Sch. With Positive Sym	60.78	37.97		

*P<0.005 **P<0.01

Table 4 indicates that there are significant differences between two group's means in number of categories (0.005) and attention shift (0.01). In other words, considering means, patients with negative symptoms had success on fewer categories and have more total trails related to attention shift as compared with patients with positive symptoms.

The correlations of the five criteria of WCST and the fifteen scored errors of Bender were calculated. The significant correlation results are shown in the Table 5.

Table 5: results of significant correlations of between five criteria of WCST and fifteen scored errors of Bender

WCST			
Necessary time for success on the first category	Perseveration		
_	0.006	Perseveration	Bender
0.008	_	Concretization	

Results indicate that there were significant correlation between the perseveration in Bender and perseveration in WCST and between concretization in Bender and necessary time for success on the first category in WCST.

4. Discussion

Some of the results, regardless of negative and positive symptoms, indicated functions of schizophrenic patients on Bender and WCST neuropsychological tests.

Results of comparisons indicated that schizophrenics with negative symptoms had many errors on distortion, rotations, overlapping, and splitting in Bender and weaker performance on all of the five criteria of WCST. But in Bender, these differences were significant only for rotation and shorting. Also in WCST these differences were significant only for number of categories and attention shift. These results had consistency with results of research that showed schizophrenics had poor performance on Bender and WCST. Furthermore, these results indicate that some of the functions that evaluated by Bender and WCST had severe impairments in schizophrenics with negative symptoms. In other words, it is probable that the frontal impairments in patients with negative symptoms are more severe than in patients with positive symptoms.

Also, results indicate that the two tests had some relationships. In other words, perseveration in the two tests and concretization in Bender and necessary time for success on the first category in WCST had significant correlation with each other. Thus, these two neuropsychological tests, partially, assess the same functions and are sensitive to the same mental abilities.

Generally, the results indicated that if schizophrenia is a neurocognitive illness and Bender and WCST are tests that assess prefrontal functions, then some of these functions in patients with negative symptoms were damaged more severely than in patients with positive symptoms. Also according to Stuss and Night (2002) and Mesulam

(2000), transcendence of default mode responsibilities of prefrontal in patients with negative symptoms has more severe impairments than patients with positive symptoms.

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